



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Nicholas R. Fish	Project Number J1008
Project Title Quantum Levitation	
Objectives/Goals The objective of my project was to test if changing the angle of a neodymium magnet would affect the amount of time it would hover over a superconductor.	
Abstract Methods/Materials For my project, I used a superconductor, four Neodymium magnets, liquid nitrogen, a stopwatch, and a Dewar container to hold the liquid nitrogen. I got the superconductor, neodymium magnets, and the liquid nitrogen container off Amazon. I got the liquid nitrogen from a company called Praxair. To conduct my experiments, I first poured some liquid nitrogen into a plastic bowl. Then I placed the superconductor in the liquid nitrogen for about 1 minute. Then I placed it onto the table and immediately placed the neodymium magnet array above at one of the four angles, and also started the stopwatch. When the magnet completely fell to the ground, I stopped the stopwatch and recorded the time. I repeated this three times for the four angles.	
Results The shallower the angle of the neodymium magnet, the longer it was quantum locked above the superconductor. When the neodymium magnets were at 0 degrees, the average hovering time was 30 seconds. When the magnets were at 30 degrees, they hovered for around 26 seconds. When the magnets were at 60 degrees, they hovered for around 9 seconds. Lastly, when the magnets were at 90 degrees, they hovered for around 1.5 seconds.	
Conclusions/Discussion When the magnet was at a more shallow angle, the magnet hovered for a longer time. This could theoretically allow hover trains to hover for a longer period of time.	
Summary Statement I showed that changing the angle of a neodymium magnet hovering over a superconductor has a significant affect for the amount of time it hovers.	
Help Received For safety purposes, my father helped me handle the liquid nitrogen.	